

# Jagadish Chandra Bose and the anticolonial politics of science fiction

The Journal of Commonwealth Literature

1–18

© The Author(s) 2020



Article reuse guidelines:

[sagepub.com/journals-permissions](https://sagepub.com/journals-permissions)

DOI: 10.1177/0021989420966772

[journals.sagepub.com/home/jcl](https://journals.sagepub.com/home/jcl)**Christin Hoene** 

Maastricht University, Netherlands

## Abstract

In postcolonial studies there are two main strands of argument concerning the legacies and effects of cultural imperialism on science fiction as a literary genre. The first strand presents a critical reading of Western science fiction of the nineteenth and early twentieth century as a genre that is deeply embedded in the discourses and ideologies of colonialism and imperialism (Rieder, 2008; Kerslake, 2007). The second strand presents a critical reading of the writing back of postcolonial authors, stressing the subversive elements of both science and fiction and their power to undermine dominant narratives of cultural imperialism and (neo)colonialism (Chambers, 2003; Hoagland and Sarwal, 2010; Langer, 2011; Smith, 2012; Varughese, 2013 and 2017). In this article I focus on a piece of colonial-era science fiction from a non-Western writer: Jagadish Chandra Bose's short story "Runaway Cyclone". First published in 1896 and republished in an extended version by the author in 1921, I analyse how Bose's story combines elements of science fiction and magical realism. I then argue that Bose turns the narrative tropes of Western science fiction on their head and thus undermines Western science as an epistemological tool of imperial control. Reading "Runaway Cyclone" alongside Bose's non-fictional accounts on science in colonised India will then reveal a philosophy of science that embraces Western science and Indian philosophy, which in turn can be read as a politics of science that is in effect anticolonial.

## Keywords

Jagadish Chandra Bose, colonial literature, magical realism, postcolonial theory, science fiction

The short story "Runaway Cyclone" is one of the first works of Indian science fiction written in Bengali (Chattopadhyay, 2013: n.p.). It was written by the Indian scientist Jagadish Chandra Bose<sup>1</sup> (1858–1937) in 1896 for a short story competition sponsored by a hair oil company (which Bose won), and revised and republished 25 years later by Bose

---

### Corresponding author:

Christin Hoene, Maastricht University, Grote Gracht 90–92, Maastricht, 6200 MD, Netherlands.

Email: [c.hoene@maastrichtuniversity.nl](mailto:c.hoene@maastrichtuniversity.nl)

for his book *Abyakto* (1921), a collection of mostly non-fictional writings.<sup>2</sup> “Runaway Cyclone” features a cyclone that threatens Calcutta, and a man who throws a bottle of hair oil overboard a ship and thus prevents the cyclone from wreaking havoc on land. The story also features Bose’s philosophy of science. Combining his Western education and the monistic imaginary of Vedantic Hinduism, this philosophy is a thinly-veiled critique of colonial scientific institutions in particular and of the epistemology of Western science as a justification for imperialism in general. This becomes especially clear in the 1921 version of the story, which I will analyse in detail in the first part of this article. I will then relate this fictional story to Bose’s nonfictional writings, focusing on three speeches he gave in the span of 16 years: his scientific lecture at the Royal Institution in London in 1901; his presidential address at the annual conference of the Academy of Bengali Literature in 1911; and his inaugural speech at the opening of his own research institute in Calcutta in 1917. This analysis will allow me to distil Bose’s philosophy of science and to show how it was influenced by his Western education and by Indian philosophy. I then argue that Bose’s scientific imaginary contributes to an anticolonial and nationalist narrative that posits science “made in India” as a hallmark of Indian modernity and a pathway towards independence.

In order to substantiate this argument, I begin this article with a theoretical overview of how postcolonial studies have so far, by and large, engaged with the genre of science fiction. I then analyse how Bose’s short story subverts the genre’s discursive tropes of imperialism by including elements of magical realism. I argue that Bose develops the genre of colonial Bangla science fiction into a critical tool that he uses to sketch his philosophy of Indian science. This allows him to critique colonial power as based on the narratives of Western scientific progress and knowledge. With reference to Gyan Prakash (1999) and Partha Chatterjee (1986; 1997), I then discuss the political implications of Bose’s philosophy of science in the context of the Bengali nationalist narratives of the late nineteenth and early twentieth centuries. Combining Western scientific education with Indian philosophical thought, Bose’s scientific imaginary reveals what he considers to be the limitations of Western scientific modernity. And this, I conclude, provides the conceptual link between his philosophy of science, as featured in “Runaway Cyclone” and his speeches, and the anticolonial politics of nation-building.

## **Postcolonial studies and science fiction**

In postcolonial studies, there are two main strands of arguments concerning the legacies and effects of cultural imperialism on science fiction (SF) as a literary genre. The first strand presents a critical reading of Western SF of the nineteenth and early twentieth century as a genre that is deeply embedded in the discourses and ideologies of colonialism and empire (e.g. Csicsery-Ronay, 2003; Rieder, 2008). The second strand presents a critical reading of both colonial and postcolonial SF through the lens of postcolonial theory, stressing the subversive elements of both science and fiction and their power to undermine dominant narratives of cultural imperialism and (neo)colonialism (Chambers, 2003; Kerlake, 2007; Hoagland and Sarwal, 2010; Langer, 2011; Smith, 2012; Varughese, 2013 and 2017). Of the two, this article is concerned with the former issue, namely the relationship between colonial SF and imperialism, but with a twist. Instead

of analysing how colonial-era SF from the West relates to European cultural imperialism, I focus on a piece of colonial-era SF from an Indian writer and how it subverts European cultural imperialism: “Runaway Cyclone” by Jagadish Chandra Bose.

As John Rieder argues in *Colonialism and the Emergence of Science Fiction*, “colonialism is a significant historical context for early science fiction” (2008: 2). This holds not only because the rise of the genre in the West coincided with the period of high European imperialism, but also because the stories directly engage colonialism on a content level (Rieder, 2008: 3). Similarly, Patricia Kerslake in her book *Science Fiction and Empire* defines “the function and manipulation of political power, of empire and its abuses within the genre” as one of the “most important and revealing foundations of SF” (2007: 1). Major tropes of science fiction as they relate to empire include, according to Kerslake, the themes of empire, power, and imperialism; the figure of the other; and the notions of centre and periphery (2007: 190). Ericka Hoagland and Reema Sarwal, in their introduction to the edited collection *Science Fiction, Imperialism and the Third World*, define imperialism as “one of SF’s most dominant definitional markers” (2010: 9). They outline four aspects that link SF with imperialism: first, science fiction’s relationship to history; second, the self–other dichotomy that is central to both science fiction and the discourse of imperialism; third, and in reference to Greg Grewell and Frederic Jameson, the “‘master narratives’ of SF film — the explorative, the domesticative, and the combative”; and, fourth, science fiction’s emphasis on “social and ethical issues” (2010: 9). As Hoagland and Sarwal argue, “these elements serve as a framework for articulating a definition of postcolonial science fiction” (2010: 9). And, as I will argue in relation to Bose’s “Runaway Cyclone”, they also serve as a framework for anticolonial SF.

As to science fiction’s relationship to history (the first aspect that links the genre to imperialism, according to Hoagland and Sarwal), “Runaway Cyclone” is firmly situated within the context of colonial Calcutta. But instead of telling the story from the perspective of the colonizer, the story’s narrator is a local Indian man. Thus, Bose turns the colonial dichotomy of self versus other on its head. As I will explore in detail below, it is the Western characters that are rendered marginal, other, and mere caricatures of the typical hero figures in Western SF. The master narrative of exploration is equally inverted. The story features an English circus director and a German scientist, who embody the genre-typical figures of the would-be-explorer and the would-be-discoverer. However, both fail in their respective quests to invade and explain. Turning two of the genre’s major tropes — the self–other dichotomy and the master narrative of exploration — on their heads, Bose engages with colonial history and its ethical implications from the perspective of the colonized. As outlined below, the story thus presents a scathing critique of colonialism as experienced by the colonized.

As to the particular role of science in science fiction and how scientific knowledge relates to the discursive tropes of imperialism, Rieder argues that Western colonial SF “articulates the distribution of knowledge and power at a certain moment of colonialism’s history” (2008: 3). And it is the epistemology of Western knowledge as one of the foundations of Western colonial power that Bose challenges in “Runaway Cyclone”. As I analyse in detail below, it is indigenous Indian knowledge that saves the day, while Western knowledge and colonial scientific institutions are shown to be hap- and helpless in trying to make sense of and providing a solution for the problem at hand. This

undermines the “master trope of technological unevenness” (Rieder, 2008: 149), which justifies oppression of the technologically inferior race in both science fiction and colonial discourse. “Runaway Cyclone” subverts the epistemology of Western science as an instrument of imperialism. Effectively, Bose’s short story posits a philosophy of science that challenges the official colonial narrative of Western superiority and progress, of which science has traditionally been a dominant element. This inversion of narrative tropes renders “Runaway Cyclone” a colonial-era story of anticolonial SF that overturns not only the power structures of the genre but also, given the genre’s imbrication with colonial power, the power structures of imperialism itself.

### Turning Western colonial SF on its head

“Runaway Cyclone” starts with the imminent threat of a cyclone over the Bay of Bengal that is about to make landfall and devastate Calcutta. The English dailies published in Calcutta and the government’s Meteorological Office warn the population days in advance about the ever-increasing magnitude of the storm. But on the day the cyclone is supposed to happen, it does not. Nobody can explain the storm’s sudden disappearance: neither the newspapers, nor the Meteorological Office, nor Western scientists. Among them are an unnamed scientist who “published an article in *Nature* once” and a German professor who “presented an erudite article on the ‘runaway cyclone’ phenomenon” at the British Association convention at Oxford (1896/1921/2013: n.p.).<sup>3</sup> In this article, he “did provide a scientific explanation of why matter does not escape into space”, but “failed to point out why the cyclone suddenly disappeared in the Bay of Bengal”. This marks the conclusion of the first part of the story, which Bose aptly titled “a scientific mystery”. This mystery is solved in the second part of the story, which is a first-person narrative told from the point of view of a balding man (which is crucial for the story’s resolution), who finds himself on a ship in the Bay of Bengal and in the middle of said cyclone. He is on this ship due to health reasons, as he suffers from an illness for which his doctor claims the sea journey is “absolutely necessary”. That same illness has caused him to lose a lot of hair, which is why his daughter has packed him a bottle of hair oil for the journey. Just as the cyclone is about to destroy the ship, the man remembers the hair oil along with something that he recently read in a scientific journal about the effects of oil on water: “I remembered that oil calms the surface of moving water”. He chucks the bottle overboard, and the effects are instantaneous: the sea calms, the atmosphere clears up, and the cyclone dissipates. The story concludes with an explanatory paragraph about the phenomenon published in an American scientific journal. At least, the 1896 version of the story does.

Bose rewrote and republished the story in his 1921 collection of mostly nonfictional writings, *Abyakto*. As Bodhisattva Chattopadhyay points out in the annotations to his 2013 translation of the story, there are some significant differences between the two versions, including the omission of the concluding explanatory paragraph in the later one. Chattopadhyay’s translation, which is based on the 1921 version, ends instead with the first-person narrator musing about how many people were saved by just one bottle of hair oil. There are other differences between the two versions that are important for

the purpose of this article: while Bose wrote parts of the 1896 story in English, the 1921 version is written completely in Bengali. Also, in the 1921 version Bose added a seemingly curious origin story about the hair oil, which involves an English circus director who makes his way to India, and whose lion has lost his mane during the journey due to a “microbial disease”. This threatens the circus director’s existence, as his lion now resembles “a hairless street dog”. Devastated, the Englishman visits a Sanyasi upon arriving in India and prostrates himself before the holy man. Impressed by his devotion, the Sanyasi gives the circus director a bottle of said hair oil, “whose formulae had come to the Sanyasi in a dream”. Within a week, the lion grows back its mane. The hair oil thus becomes the story’s *deus ex machina* twice over: growing back the lion’s mane, it saves the circus director from ruin; and calming the stormy sea and dissipating the cyclone, it saves the people on the ship and in Calcutta from the storm.

I will return to the hair oil in due course, but I want to focus first on the marginal characters of the Western scientists and the English circus director on his fateful passage to India. Both are modelled on the stereotypical hero of Western SF who sets out to conquer a strange land in his (and it is almost always his) quest for either adventure (circus director) or knowledge (scientist). This strange land is typically either empty or inhabited by equally strange creatures that present more or less trying obstacles for the hero to overcome, which he manages due to his superior scientific knowledge and/or technological prowess. The narrative tropes of the stranger and the strange land are so pervasive in science fiction that Jessica Langer calls them “the central myths of the genre” (2011: 3). She elaborates that the “figure of the alien — extraterrestrial, technological, human-hybrid or otherwise — and the figure of the far-away planet ripe for the taking are deep and abiding twin signifiers in science fiction” (2011: 3). Moreover, she links these narrative tropes to colonialism and asserts that they are “the very same twin myths of colonialism” (2011: 3). The alien becomes the indigenous other, and the alien planet becomes one of the “many blank spaces on the earth” that so fascinate Marlow in Joseph Conrad’s *Heart of Darkness* (2006/1899: 8).

In “Runaway Cyclone”, Bose takes the narrative tropes of the stranger and the strange land and turns them on their heads. By starting out in the supposedly strange land, the land is immediately appropriated by the narrative voice, which is revealed to be that of a local man. There is no Western hero who comes, sees, and conquers. Instead, it is an Indian man who saves the day by throwing a bottle of Indian hair oil overboard an Indian ship. Bose turns the would-be stranger into the hero and the would-be vessel of colonial conquest into the indigenous vessel of salvation. Moreover, the would-be discoverers, the English circus director and the German scientist, are mere cartoon versions of their mythical selves as heroes of Western SF, as both of them fail in their project of cultural and scientific imperialism. Arriving in India, the circus director’s star of the show, his lion, loses his mane and now resembles “a hairless street dog”. And the German scientist, in an article seeking to explain the disappearance of the cyclone, talks about anything but the disappearance of that cyclone and fails to know, let alone explain, the truth of what happened. Bose thus deftly undermines the twin myth of science fiction and colonialism and appropriates it for the purpose of promoting an Indian philosophy of science that integrates both knowledge and the imagination, the scientific and the spiritual.

## **Integrating science fiction and magical realism**

It is not only the German scientist who fails in his quest to explain the disappeared cyclone; it is also the colonial scientific institutions and Western science as a whole that fail in their epistemological project to make sense of what Bose at the outset of the story describes as a “supernatural event”. The story states that “[a] number of articles were published in various scientific journals to explain the phenomenon. But till now no explanation of the event has been found satisfactory”, and thus the event “rocked the scientific communities of America and Europe”. The Meteorological Department is equally at a loss to explain what happened, and the colonial government finds itself under immense public pressure to justify “new equipment worth over one lakh Rupees [that] had been purchased for the Meteorological Department”. However, it later turns out that the equipment was not faulty — after all, the cyclone really did occur — it just could not account for the extreme weather event’s sudden disappearance. And this is where the hair oil and Bose’s philosophy of science come in.

In the story, the effects of the hair oil are presented as scientifically validated: the pomade works on the lion within a week, and the source for the protagonist’s knowledge about the effects of oil on water is a scientific journal. But there are elements in the story that complicate its straightforward classification as science fiction. Although the hair oil is presented as a scientific solution to both the circus director’s plight and the threat of the cyclone, the origin of the hair oil is anything but scientific, as its formula came to a Sanyasi in a dream. Also, the scale of the oil’s effect borders on the miraculous in both cases: growing back a lion’s mane by far exceeds covering up a couple of bald patches on a man’s head, and dissipating a cyclone goes vastly beyond the hydrophobic quality of oil and its effect on the surface tension of water. Even the protagonist is sceptical and describes the immediate effect of the hair oil on both water and atmosphere as preternatural: “Like magic the sea became calm, and the wonderful cooling oil even calmed the entire atmosphere”. While the effect of the hair oil on mane and cyclone is presented as scientifically validated, the scale of these effects as well as the hair oil’s origin story are rendered miraculous.

This, as well as the characters of the English circus director and the Sanyasi as a religious holy man, is more reminiscent of magical realism as a literary genre than of science fiction. “Runaway Cyclone” at the same time conforms to both genres and, by doing so, defies them: true to science fiction, the explanations provided for the hair oil’s effects on lion and cyclone are scientific. This, however, defies the principle of magical realism, according to which the magical is contained within the real but remains inexplicable and irreducible to it. True to magical realism, on the other hand, the origin story of the hair oil and the scale of its successes are miraculous. This defies the principle of science fiction, according to which any phenomenon, however outlandish, must have a scientific foundation, whether the science behind it be real or imagined. As literary genres, magical realism and science fiction are therefore often considered to be mutually exclusive; a story is either of one genre or of the other. As broad as it is in terms of definition, magical realism is often defined in the negative as not being science fiction.<sup>4</sup> The main difference between the two genres is usually considered to be this: where the non-realist elements in science fiction can be (more or less convincingly) based in science, the magical

elements in magical realism are not explained. We are not given the cause of the magic, which is thus rendered integral to the realism. This makes the seemingly oxymoric phrase of magical realism comprehensible. As Maggie Ann Bowers explains it in *Magic(al) Realism*: “One of the characteristics of science fiction that distinguishes it from magical realism is its requirement of a rational, physical explanation for any unusual occurrence” (2013: 28). Even when things appear to be alien or different, science fiction dictates that they be “explicable within or by extension of known science” (2003: 29). However, this is not the case in Bose’s story. In “Runaway Cyclone”, we find both: the hair oil calms the storm, which is a perfectly scientific (albeit largely exaggerated) truth; but the origin of the hair oil is the dream of a holy man, and this mystification is taken to be perfectly plausible. To put it succinctly: the hair oil is magical in its origin, scientific in its effect, and miraculous in its impact. Rather than being mutually exclusive, the miraculous and the scientific are integrated in Bose’s short story and become mutually dependent. It is this combination of scientific and supernatural knowledge that provides the answer to the titular “scientific mystery”. Put differently, the story’s elements of magical realism subvert the colonial politics of Western science as featured in Western SF.

In order to account for this convergence of the scientific and the mysterious, Chattopadhyay employs the concept of *kalpavigyan*, a Bengali neologism with Sanskrit roots that is often used synonymously for Indian SF (2016: 435). Unwrapping the individual linguistic components of the term, Chattopadhyay explains that *vigyan* signals “linkages and intersections among and between diverse kinds of knowledge” (2016: 437). This includes, but is not limited to, scientific knowledge. The other component of the term, *kalpana*, highlights the role of imagination in achieving this knowledge: “the word *kalpana* unwraps the qualitative aspect of imagination; it signals the singular power of the human mind to conceptualize change as a movement in time” (2016: 436). In other words: imagination is the power necessary for the mind to arrive at real knowledge, scientific and otherwise. And it is precisely this imagination that the Western scientists in “Runaway Cyclone” lack. In their reliance on scientific knowledge alone and their negligence of imagination and the spiritual, the Western scientists, the colonial government, the Meteorological Office, and the English newspapers all remain ignorant of the solution, which relies on the ability to imagine different kinds of knowledge: scientific and spiritual.

One of the crucial differences between the 1896 and the 1921 versions of the story is its ending. The earlier version concludes with a short passage in English, a “scientific explanation [that] was published by *Scientific American*”, which states:

a passenger on board the *Chusan* threw overboard a bottle of KUNTALINE while the vessel was in the Bay of Bengal and the storm was at its height. The film of oil spread rapidly over the troubled waters, and produced a wave of condensation, thus counteracting the wave of rarefaction to which the cyclone was due. The superincumbent atmosphere being released from its dangerous tension, subsided into a state of calm. Thus by the merest chance, a catastrophe was averted.

While the 1896 ending at least partly restores the integrity of Western (albeit not colonial) scientific institutions as embodied by the scientific journal that publishes this explanation, the 1921 version of the story resolutely denies any such resolution. Instead, it

situates the solution firmly in India and in Indian knowledge: Bose drops the explanatory paragraph and instead includes the hair oil's origin story, which is inclusive of both scientific and spiritual knowledge. Where before the solution was purely scientific and the source of the knowledge were two Western scientific journals (one read by the protagonist, the other quoted at the end), the original source of the knowledge is now the Sanyasi and his dream. This does not only contradict the literary conventions of Western SF, as outlined above; it also clashes with the Western understanding of science as Bose knew it, and as I will outline below. Bose introduces a barely-disguised critique of colonial scientific institutions and of Western scientists, who fail to account for the cyclone's sudden disappearance. As far as they know, there simply cannot be a purely rational and scientific explanation for the phenomenon. And, strictly speaking, there is none. The properties of the hair oil are as much scientific in their effect as they are supernatural in their origin and miraculous in their scale. The Western scientists' failure to explain the phenomenon of the disappeared cyclone is a failure of the imagination. The key to the mystery at the heart of "Runaway Cyclone" is a holistic view of science that finds repercussions in monism, a view that Bose also champions in his nonfictional writings, which I analyse below.

While Bose was one of the first authors of Bangla SF, he was not the only Bengali author to write works of science fiction at the turn of the last century.<sup>5</sup> "Runaway Cyclone" can thus be read in a broader context of colonial-era SF written by the colonized. Atanu Bhattacharya and Preet Hiradhar (2014) trace the beginnings of the genre back to two stories: Kylas Chunder Dutt's (1817–1859) "A Journal of Forty Eight Hours of the Year 1945" (published in 1835) and "The Republic of Orissa: A Page From the Annals of the Twentieth Century" (published in 1845) by Shoshee Chunder Dutt (1824–1886). Bhattacharya and Hiradhar argue that both stories combine the fabular modes of Bengali storytelling with the "possibilities of the new science that had percolated among the newly emergent [Bengali] middle class" (2014: 287). Their genealogy of Bangla SF then moves on to Hemlal Dutta's "Rahasya" ("The Mystery"), published in 1882 (erroneously dated to 1892 [287]), and Bose's 1896 "Niruddeshher Kahini" ("The Story of the Missing One"), as "Palatak Tufan" ("The Runaway Storm" or "Runaway Cyclone") was originally titled.<sup>6</sup> In a later article on the young adult Bengali SF of Premendra Mitra (1904–88), Bhattacharya and Hiradhar read "Runaway Cyclone" as a tall tale (2018: 175). In reference to Mitra's fiction, they define the basic premise of tall tales to be their "truth value": "it is not the narration of the events themselves that calls its truth value into question; the non-verifiability of the tale emerges from the uncertain position that the narrator occupies" (2018: 175). Bhattacharya and Hiradhar argue that "Runaway Cyclone" is a tall tale because it ends, in the characteristic style of the genre, "with an all-too-simple scientific explanation of an extraordinary event" (2018: 175). However, and crucially, Bhattacharya and Hiradhar cite the 1896 version of Bose's story, which lacks the origin story of the hair oil and instead ends on the brief explanatory paragraph as published in the scientific journal quoted. As I have argued above, it is precisely this origin story, which features the circus director as would-be discoverer, that allows for a reading of the story as a genre hybrid between science fiction and magical realism. In colonial-era Bengali SF, however, the function of both, tall tale and magical realism, is the same: to foreground "a subversive model — a sort of a countervailing mechanism — of colonial enlightenment science" (2018: 175; and 2014: 286); or, to

put it differently, to undermine the epistemological power of Western science in the context of colonialism. In his short story, Bose introduces a new term for the genre of Bangla SF, thus officially founding the genre (Chattopadhyay, 2013: n.p.). This term, *baigyanik rahasya*, is the Bengali term for science fiction and literally translates into English as “scientific mystery” (Bhattacharya and Hiradhar, 2014: 287) — which is also the subtitle of Bose’s story. With “Runaway Cyclone”, Bose develops the genre into a critical tool that he uses to sketch his philosophy of Indian science and thereby to critique colonial power as based on Western scientific progress and knowledge.

## Bose’s philosophy of science

In order to understand Bose’s philosophy of science, it is worth quoting, at some length, the concluding paragraph of his 1901 lecture at the Royal Institution in London. Bose’s lecture that night focused on experiments that compared the responses of different materials to external stimuli, such as electricity. Using delicate measuring instruments, most of them by his own design, Bose showed that the response curves of organic material (such as muscle and plant tissue) and the response curves of inorganic material (such as iron oxide and tin) were remarkably similar. This, concluded Bose, was proof that barriers between the organic and inorganic world — what he refers to as “the living and non-living” — do not exist, and that therefore boundaries between the different scientific disciplines of physics and physiology should be abandoned:

I have shown you this evening autographic records of the history of stress and strain in the living and non-living. How similar are the writings! So similar indeed that you cannot tell one apart from the other. [...] Amongst such phenomena, how can we draw a line of demarcation, and say, here the physical ends, and there the physiological begins? Such absolute barriers do not exist. [...] It was when I came upon the mute witness of these self-made records, and perceived in them one phase of a pervading unity that bears within it all things [...] that I understood for the first time a little of that message proclaimed by my ancestors on the banks of the Ganges thirty centuries ago — “They who see but one, in all the changing manifoldness of this universe, unto them belongs Eternal Truth — unto none else, unto none else!” (qtd. in Geddes, 1920: 97–98)

In this conclusion, Bose proclaims two things that are of fundamental importance for understanding his philosophy of science. First, he considers disciplinary boundaries between the sciences to be superfluous. And, second, he contextualizes this interdisciplinary approach to science in the context of Vedantic Hinduism, more specifically the monistic belief in the unity of all things (Brown, 2016; Nandy, 2003). Over the following decades of his life and work, these two core beliefs were to become the pillars of Bose’s philosophy of science, which combined his Western-style education with his Indian belief system and resulted in a distinctly Indian and explicitly non-Western conceptualization of his work in particular and the natural sciences more generally.

In order to understand the duality of Bose’s philosophy of science, we have to take a brief detour to chart his education and career development. In 1880, Bose graduated from St. Xavier’s College, Calcutta. He then went to England to study medicine at the University of London and natural sciences at Christ’s College Cambridge. In 1884, he

graduated with a BSc from Cambridge in the Natural Science Tripos and a BSc from London University. He returned to Calcutta and was appointed the first Indian Professor of Physics at Presidency College, a position he would hold until opening the Bose Research Institute in 1917. Throughout the 1890s, Bose's reputation as a physicist grew in India and the West, particularly in the UK. He was the first scientist from India to be invited to deliver a Friday Evening Discourse at the Royal Institution in London in January 1897. As Subrata Dasgupta argues in his biography of Bose, this marked "a moment of profound history" for Bose and for India (1999: 2). During his 1896–1897 trip to Europe, Bose also delivered lectures in Liverpool, Berlin, and Paris. His scientific papers on electromagnetic waves were published in leading scientific journals, such as *The Electrician* and the *Proceedings of the Royal Society*. In Dasgupta's words, Bose was "a pioneer of modern science in India" (1999: 4). However, during his next trip to Europe in 1900–1901, it became clear to his Western colleagues that Bose, the physicist, had branched out into the fields of plant physiology and biology; the conclusion to his 1901 lecture at the Royal Institution, quoted above, shows as much.

Three things had changed since Bose's last European trip in 1896–1897, and the combination of all of them severely damaged Bose's reputation in the West. One, his research was now interdisciplinary in nature at a time when Western scientists strongly defended disciplinary boundaries; two, his work presented a shift from physics to the field of plant physiology, which threatened the authority of eminent physiologists such as Augustus Waller (1856–1922);<sup>7</sup> and three, his thinking about science was overtly influenced by monism. In Bose's words, by crossing disciplinary boundaries and suggesting to abandon them altogether, he had "unwittingly strayed into the domain of a new and unfamiliar caste system and so offended its etiquette" (Geddes, 1920: 229). Moreover, his belief in what he variously called "The Law Universal" (1917: 2), "the idea of unity" (1920: 236), and "the great generalization of the unity of all life" (1986: 110) made his research divisive, as it matched a common prejudice against Indian scientists, according to which they were not capable of exact research in the natural sciences because of their disposition towards mysticism. As Bose described it, "[a]n unconscious theological bias was also present which confounds ignorance with faith. [...] To the theological bias were added the misgivings about the inherent bent of the Indian mind towards mysticism and unchecked imagination" (1920: 229). On this point, Patrick Geddes, Bose's contemporary and friend, recalls in his 1920 biography of Bose:

There was also a strong doubt, not to say prejudice, against the capacity of an Indian to take any important position in science. Intellectual acuteness in Metaphysics and Languages had always been frankly acknowledged, but it was assumed that India had no aptitude for the exact methods of science. For science, therefore, India must look to the West for her teachers. (1920: 33)<sup>8</sup>

The hostility that Bose subsequently faced by some of his Western colleagues seems to have sharpened rather than dulled his criticism of disciplinary boundaries in Western sciences, as his 1911 talk at the annual conference of the Academy of Bengali Literature shows. Throughout this speech, Bose champions an integrated and interdisciplinary view of the sciences. For him, interdisciplinarity is crucial in order to attain what he variously calls "the comprehensiveness of truth" and the "underlying unity" (1986: 28) of the sciences:

The physicist, the chemist, and the biologist entering by different doors, each one his own department of knowledge, comes to think that this is his special domain, unconnected with that of any other. [...] We must remember that all enquiries have as their goal the attainment of knowledge in its entirety. The partition-walls between the cells in the great laboratory are only erected for a time to aid this search. Only at that point where all lines of investigation meet, can the whole truth be found. (1986: 29)

Crucially, Bose characterizes the subdivision of scientific disciplines as the Western approach to sciences, while the interdisciplinary approach favoured by himself marks a distinctly Eastern, and even more distinctly Indian, approach to science: “You are aware”, he addresses his audience at the Academy of Bengali Literature,

that in the West, the prevailing tendency at the moment is, after a period of synthesis, to return upon the excessive sub-division of learning. The result of this specialisation is rather to accentuate the distinctiveness of the various sciences, so that for a while the great unity of all tends perhaps to be obscured. (1986: 28)

Bose goes on to argue that such “a caste-system in scholarship” limits “the comprehensiveness of truth” (28). In opposition to this, the “Eastern aim”, Bose argues, has been the opposite: “namely, that in the multiplicity of phenomena, we should never miss their underlying unity. After generations of this quest, the idea of unity comes to us almost spontaneously, and we apprehend no insuperable obstacle in grasping it” (28). We see in Bose’s writings clearly the influences of monistic thought and the central belief in “the non-dualism of the Vedantic tradition — the oneness and continuum within which all life exists” (Chattopadhyay, 2016: 442); which, as Ashis Nandy shows, also influenced other Indian scientists at the time. In his study of Bose and his contemporary, the mathematician Srinivasa Ramanujan (1887–1920), Nandy writes:

the Indian imagination [...] uses non-dualist thought to impose order on diversities, contradictions, and oppositions, and a unified worldview on a fragmented society [...] The non-dualist concept of an impersonal timeless absolute gives a special meaning to the concept of scholarship. The scholar is expected to extend the perimeters of empirical knowledge while being open to its transcendental meaning. (2003: 62)

In summary, four things are crucial to grasp Bose’s philosophy of science: Bose believes that, first, there is an underlying truth that governs all of nature and science; second, that Indian scientists like himself are readily prepared to conceptualize the idea of such an underlying and unifying truth; third, that only an interdisciplinary approach to science can make this truth comprehensible; and fourth, that compared to the Western approach to science, his Indian philosophy of science is the better one. Bose repeats these arguments in several speeches throughout the years, and most prominently at the opening of his own research institute in Calcutta in 1917 (which is still in operation to this day): “Thus the lines of physics, of physiology and of psychology converge and meet. And here will assemble those who would seek oneness amidst the manifold. Here it is that the genius of India should find its true blossoming” (1920: 239–240).

In his extensively researched biography on Bose, Dasgupta offers a late twentieth-century perspective on Bose's philosophy of science. To an extent, Dasgupta shares the suspicions of Bose's contemporaries vis-à-vis his metaphysics (although not their prejudices vis-à-vis his general scientific expertise). Dasgupta argues that Bose "allowed his metaphysics to intrude upon his scientific writings", which "may not have endeared him to scientists" (1999: 171). Moreover, what Bose possessed in scientific exactitude, he lacked in philosophical scepticism, according to Dasgupta: "Bose's appeal to Indian philosophy was entirely uncritical. [...] For Bose, his experiments with metals and plants were a vindication of his interpretation of ancient Indian wisdom. He did not allow himself any ground for philosophical scepticism" (1999: 171). In other words, Bose's thesis of the unity of the living and non-living, which Dasgupta terms the "Boseian thesis" (1999: 164), suffers from confirmation bias: the interpretation of the results of scientific experiments in the light of Indian philosophy in order to arrive at a metaphysics of science that always already presumes an underlying unity. The Boseian thesis thus becomes a self-fulfilling prophecy. Therefore, the scientific merit of Bose's philosophy of science is debatable. But its political merit in the context of anticolonial nationalist thought, I suggest, is clear. To argue this point and conclude this article, I will now turn to consider the anticolonial and nationalist implications of Bose's philosophy of science. This will allow me to refute Gyan Prakash's claim that Bose "did not seek to define an 'Indian science'" (1999: 229–30). I instead conclude that Bose's philosophy of science as featured in "Runaway Cyclone" and in his numerous speeches can, in fact, be understood in the context of the anticolonial and nationalist discourse of the time.

## Bose's politics of science

In *Another Reason: Science and the Imagination of Modern India* (1999) Gyan Prakash analyses how science in colonized India served both as an instrument for the British to uphold colonial control and for the colonized elite to undermine it. Prakash's main objective is to draw out the contradictory elements of the narrative that posits Western science solely as an instrument of colonial power. Throughout the book, he argues that it is not that straightforward; in fact, the same science and technology that was introduced by the colonizer was often appropriated by the colonized to undermine and usurp colonial power. As Prakash puts it:

So pervasive and enduring is colonialism's triumphant self-description of its own career that we frequently fail to identify the subterfuges, paradoxes, distortions, and failures that punctuated its exercise of power. At issue here is the history of those practices that arose in the field of colonial power but also reordered its terms, that anchored and sustained British rule but also altered its conditions of existence. (1999: 19)

Science, Prakash argues, is one of those practices. Supporting the colonial myth of bringing progress and civilizing the natives supposedly for their own good, science was introduced as "an aspect of colonial power" (1999: 8), but then developed into a sign of Indian modernity and anticolonial nationalism. And, as Prakash shows, the colonized, Western-educated Bengali elite, to which Bose belonged, played a crucial role in this

process of appropriating science in order to undermine colonial power. For the Bengali elite, science became implicated in the project of anticolonial nation building: “The idea of India as a nation, then, meant not a negation of the colonial configuration of the territory and its people but their reinscription under the authority of science” (1999: 7). More specifically, Prakash traces how the colonized elite created a hybrid form of knowledge that combined Western science with local cultural and religious knowledge and tradition: “Educated in Western-style institutions and employed in colonial administration and modern professions, this elite stood on the interstices of Western science and Indian traditions, embodying and undertaking the reformulation of culture in their reach for hegemony” (1999: 8). As outlined throughout this article, Bose’s philosophy of science was precisely such a hybrid creature of “Western science and Indian traditions”. And, following Prakash’s logic, this is what made Bose’s scientific style political in the sense that it contributed to the anticolonial discourse of nationalism.

Curiously, however, Prakash asserts that Bose “did not seek to define an ‘Indian science’” (1999: 229–230). Both Dasgupta and Nandy disagree; as do I, in reference to Bose’s own writings. For Bose, Dasgupta argues, science was “inextricably entwined with the Indian past and the colonial present. Science was also a path to the discovery, or recovery, of self-pride, as much the collective pride of the Indian people as of the personal self” (Dasgupta, 1999: 45). Ashis Nandy strikes a similar note when he describes Bose as “the first generation of modern scientists in India” (1998: 19) whose aim it was to create an “Indian structure of science” (1998: 20). Dasgupta criticizes Nandy for this sweeping generalization and brings the discussion back to the methodology of science. He concludes that Bose’s work as a physicist throughout the 1890s was “entirely within the canons of Western science” and thus “far from the ‘alternative science’ which Ashis Nandy has suggested” (Dasgupta, 1999: 63). I think that Nandy and Dasgupta are both right, but that their conclusions about the self-consciously styled “Indianness” of Bose’s science refer to different periods of Bose’s life and work. And these periods can be mapped closely to the two publication dates of “Runaway Cyclone”. When first published in 1896, Bose was in the middle of his work on electric waves, the results of which would make his name as a physicist in India and in the West. The ending of the 1896 version of “Runaway Cyclone”, which quotes a Western scientific journal, resolutely upholds the authority of meaning of Western science. In that sense, Bose’s science, as reflected in the story, is indeed, and as Dasgupta puts it, “entirely within the canons of Western science” (1999: 63). But 25 years later, when Bose republishes “Runaway Cyclone” in 1921 and not only changes the ending in the ways described above, but also writes the whole story in Bangla and includes a backstory that challenges the epistemology of Western science, we have to acknowledge that Nandy has a point. Bose does not only try but arguably also succeeds in building up “an entirely new Indian structure of science” (Nandy, 1999: 20); and the intrinsic political implications of nation-building become apparent when we return to his speeches.

In “Literature and Science”, Bose calls on Indian scientists to not simply decry the lack of resources, but instead to produce work to the best of their abilities and circumstances as a source of national pride: “Rise from your depression! Cast off your weakness. Let us think, ‘In whatever condition we are placed, that is the true starting-point for us’. India is our working-place, and all our duties are to be accomplished here, and

nowhere else” (2011: 34). Bose’s anti-imperial politics become even clearer when looking at his inaugural address at Benares University from 4 February 1916, in which he attributes the “cause of our scientific ill-success” to “the want of true recognition of the experimental side” (1986: 165), which is directly caused by imperialism: “This may have been due to decline of national life, however, brought about, or to the general distraction consequent on the unsettled condition of the country” (1986: 165). The “unsettled condition of the country” can conclusively be read as anticolonial criticism, particularly when read in the context of other speeches such as “The Uphill Way”. In this autobiographical speech that Bose delivered to his students at Presidency College (date unclear), he stresses that India is “one and indivisible” and that “we shall be indomitable in our efforts, belonging to the band of pioneers in the task of nation building” (1986: 43). In other words, Bose considers the work of scientists like himself (“we”) to be foundational to the project of nation-building. In the inaugural speech for his Research Institute, Bose charts the rise and inevitable fall of empires:

Many a nation had risen in the past and won the empire of the world. A few buried fragments are all that remain as memorials of the great dynasties that wielded the temporal power. There is, however, another element which finds its incarnation in matter, yet transcends its transmutation and apparent destruction: that is the burning flame born of thought which has been handed down through fleeting generations. (1920: 240)

Where imperial power is “temporal”, knowledge and thought are eternal and provide the foundation upon which to build not only an independent scientific tradition, Bose concludes, but also an independent nation: “We stand here to-day and resume work to-morrow, so that by the efforts of our lives and our unshaken faith in the future we may all help to build the greater India yet to be” (1920: 241). Sibaji Raha and Maqsood Siddiqi put it as follows: “When the intelligentsia all over the country were choosing political nationalism, Jagadis Chandra decided to make his nationalist and anti-colonialist statement by revising the scientific heritage of India” (2011: 966). In this way, science becomes a path to independence.

And Bose was not alone in this thinking. For the opening of his Research Institute in 1917, his friend and contemporary Rabindranath Tagore (1861–1941) presented Bose with a song for the institute, which remains its official hymn to this day. In this song, Tagore celebrates the Bose Research Institute as a temple of knowledge that enlightens scientists and enables them to lead the country towards independence: “‘Tis to the Mother’s temple ye are come | Her sacred inner courtyard: light ye them | Her precinct, ye who are her favour’d sons” (in Raha and Siddiqi, 2011: 983, lines 1–3). The temple here is Bose’s Research Institute, which is immediately appropriated and elevated in the first line of the poem from the personal to the national: Bose’s Institute becomes “the Mother’s temple” (l. 1), and the mother, of course, is India. Tagore then calls upon the scientists as India’s “favour’d sons” (l. 3) to guide the way out of the “deep dark night of waiting” (l. 7). This “band of pilgrims” (l. 8) and, crucially, this “brotherhood of freedom in the soul” (l. 21) are to destroy “the long shame | of Bharat-land!” (l. 23). In other words, the scientists, enlightened by education and free in mind, are to lead the country at large towards enlightenment, freedom, and “Victory!” (in Raha and Siddiqi, 2011:

983, l. 33). As with Bose's own dedication to his Research Institute, Tagore's poem echoes a tenet of the Bengali nationalist narrative of the late nineteenth and early twentieth centuries that considered science "made in India" a cornerstone of national identity and a pathway towards independence. Ashim Kumar Mukhopadhyay supports this by stating that "[s]cience was seen by Indians as a point of their freedom struggle" (1995: 2). On the topic of Bose's own involvement in the nationalist movement, Mukhopadhyay points out that Bose "never joined or participated actively in any political movement", but that his scientific experiments "were an alternative form of the movement for national independence" (1995: 10). He specifies this later in the book:

His [Bose's] participation in contemporary movements [such as the Bengali nationalist Dawn Society, founded in 1902], his passion and power of thought, and the fulness [sic] and force of his character found expression not on a restricted political plane, but through his sustained lifelong work which proved that "the Indian mind" was "as capable of excelling in science as in literature or philosophy". (Mukhopadhyay, 1995: 77)

Moreover, Bose and his scientific successes were appropriated by other, much more outspoken, figures of the nationalist movement, amongst them Tagore, Swami Vivekananda (born Narendranath Datta; 1863–1902), and Sister Nivedita (born Margaret Elizabeth Noble; 1867–1911) (Mukhopadhyay, 1995: 84). Vivekananda even actively discouraged Bose from active political involvement, insisting that Bose dedicate himself to science for the sake of the nationalist movement instead (Mukhopadhyay, 1995: 84).

In conclusion, science, for Bose, was political. And Indian science, as he thought and wrote about, practised, and institutionalized it, served as an instrument of the anticolonial politics of nation-building. In *A Possible India* (1997), Partha Chatterjee confirms this political reading of Bose's philosophy of science. For Chatterjee, as for Prakash, science is a sign and tool of modernity. Colonial rule is the obstacle to Indian modernity, and to "produce a distinctly national modernity" is "the cultural project of nationalism" (1997: 279), Chatterjee argues. And science is part of this project: "The attempt to find a different modernity has been carried out even in the presumably universal field of science" (Chatterjee, 1997: 279). Mentioning Bose specifically, Chatterjee briefly describes how Bose's scientific beliefs were shaped by his insights in Indian philosophy. Chatterjee concludes that "if we grasp what it was that led him to think of a project such as this, we will get an idea of the principal driving forces of our modernity" (1997: 279). To explain this in more detail, Chatterjee's larger theory of anticolonial nationalism is useful here, and in particular his concept of the inner domain of spirituality and national culture versus the outside, or material, domain of the state. As Chatterjee argues in *The Nation and its Fragments*, "anticolonial nationalism creates its own domain of sovereignty within colonial society well before it begins its political battle with the imperial power. It does this", Chatterjee continues, "by dividing the world of social institutions and practices into two domains — the material and the spiritual" (1986: 6); or, to use Chatterjee's synonyms for both, the outside domain and the inner domain. The inner domain is where nationalism can find a foothold in culture long before it tries to exert power in the material domain. And it does so by fashioning a "'modern' national culture that is nevertheless not Western" (1986: 6). This desire to construct a modernity that is distinctly Indian

and distinctly “not Western” brings us back to Bose’s philosophy of science. Science, according to Chatterjee, is part of the outside domain: “the domain of the ‘outside’, of the economy and of state-craft, of science and technology” (1986: 6). However, Bose’s philosophy of science is as much built on his Western education as it is on his belief in monism. It is this combination of the spiritual and the scientific that makes Bose’s philosophy such a fruitful space to explore the role of Indian science in the context of anticolonial nationalism. Indian science, as defined by Bose as distinctly non-Western, straddles the domains of the material and the spiritual. As such, it solves the “scientific mystery” at the heart of “Runaway Cyclone”, and it becomes a hallmark of Indian modernity and anticolonial nationalism.

## Funding

The author disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was funded by a Leverhulme Early Career Fellowship (ECF-2016-362).

## ORCID iD

Christin Hoene  <https://orcid.org/0000-0002-8086-1120>

## Notes

1. His name is also transliterated as Jagadis Chandra Bose.
2. As Bodhisattva Chattopadhyay points out in the annotations to his English translation of Bose’s story, the original Bengali title of the 1896 version is “Niruddeshar Kahini” (“The Story of the Missing One”). The 1921 title is “Palatak Toofan” (“Runaway Cyclone”). Chattopadhyay also details the differences between the two versions, some of which I refer to throughout this article (Chattopadhyay: 2013, n.p.).
3. Subsequent references are to this (1896/2013) translation of Jagadish Chandra Bose’s “Runaway Cyclone” and, since there is no pagination throughout this web source, they will be cited without parenthetical page numbers throughout.
4. See, for example, Leal (1995: 121).
5. See Gibson (2019).
6. Also see Chattopadhyay’s detailed genealogy of Bangla SF in his entry in the *The Encyclopedia of Science Fiction* (Chattopadhyay: 2019, n.p.).
7. Dasgupta chronicles how this deep-seated prejudice combined with rivalry between Bose and British scientists such as the physiologist Augustus Waller (1856–1922) negatively impacted the reception of Bose’s work in the West (1999: particularly chapters 4 to 6).
8. The prejudice of Indians’ inaptitude for science was prevalent and institutionalized in colonized India. Moreover, it served as a foundational myth and justification for British rule in India. In his “Minute on Indian Education”, parliamentarian and historian Thomas Babington Macaulay (1800–1859) stipulates that all education in India should be conducted in English, as neither the languages of India nor the minds of Indian people were allegedly suited to the study of science: “when we pass from works of imagination to works in which facts are recorded and general principles investigated, the superiority of the Europeans becomes absolutely immeasurable” (1967/1835: 722). In his position as member of the supreme council of the East India Company, which he held from 1834 to 1838, Macaulay oversaw major educational and legal reforms.

## References

- Bhattacharya A and Hiradhar P (2014) Own maps/imagined terrain: The emergence of science fiction in India. *Extrapolation* 55(3): 277–297.
- Bhattacharya A and Hiradhar P (2018) The insectesimal tall tale: Historical catachresis and ethics in the science fiction of Premendra Mitra. *Journal of Postcolonial Writing* 54(2): 174–186.
- Bose JC (1896/1921/2013) Runaway cyclone. *Strange Horizons* (2013). Chattopadhyay B (trans). Available at: <http://strangehorizons.com/fiction/runaway-cyclone/> (accessed September 2019).
- Bose JC (1917) *Quest of Truth and Duty*. Calcutta: AC Sarcar.
- Bose JC (1920) The dedication. In: Geddes P, *An Indian Pioneer of Science: The Life and Work of Sir Jagadis C. Bose*. London: Longmans, Green, and Co, 227–241.
- Bose JC (1986) *J. C. Bose Speaks*. Sen D and Chakraborty AK (eds). Calcutta: Puthipatra.
- Bose JC (2011) *Acharya Jagadis Chandra Bose in Modern Review*. Mukhopadhyay AK (ed.). Kolkata: Progressive Publishers.
- Bowers MA (2013) *Magic(al) Realism*. New York and London: Routledge.
- Brown CM (2016) Jagadish Chandra Bose and vedantic science. In: Fehige Y (ed.) *Science and Religion: East and West*. London and New York: Routledge, 104–122.
- Chambers C (2003) Postcolonial science fiction: Amitav Ghosh's *The Calcutta Chromosome*. *The Journal of Commonwealth Literature* 38(1): 58–72.
- Chatterjee P (1986/1997) *The Partha Chatterjee Omnibus: Comprising Nationalist Thought and the Colonial World, the Nation and its Fragments, and a Possible India*. Delhi and Oxford: Oxford University Press India.
- Chattopadhyay B (2013) Afterword. *Strange Horizons*. Available at: <http://strangehorizons.com/fiction/runaway-cyclone/> (accessed January 2019).
- Chattopadhyay B (2016) On the mythologerm: Kalpavigyan and the question of imperial science. *Science Fiction Studies* 43(3): 435–458.
- Chattopadhyay B (2019) Bengal. In: Clute J, Langford D, Nicholls P and Sleight G (eds) *The Encyclopedia of Science Fiction*. Available at: <http://www.sf-encyclopedia.com/entry/bengal> (accessed September 2019).
- Conrad J (2006/1899) *Heart of Darkness*. New York and London: W. W. Norton & Company.
- Csicsery-Ronay I (2003) Science fiction and empire. *Science Fiction Studies* 30(2): 231–245.
- Dasgupta S (1999) *Jagadis Chandra Bose and the Indian Response to Western Science*. Oxford: Oxford University Press.
- Geddes P (1920) *An Indian Pioneer of Science: The Life and Work of Sir Jagadis C. Bose*. London: Longmans, Green, and Co.
- Gibson ME (2019) *Science Fiction in Colonial India, 1835–1905: Five Stories of Speculation, Resistance and Rebellion*. London and New York: Anthem Press.
- Hoagland E and Sarwal R (2010) Introduction: Imperialism, the third world, and postcolonial science fiction. In: Hoagland E and Sarwal R (eds) *Science Fiction, Imperialism and the Third World: Essays on Postcolonial Literature and Film*. Jefferson, NC: McFarland, 5–20.
- Kerslake P (2007) *Science Fiction and Empire*. Liverpool: Liverpool University Press.
- Langer J (2011) *Postcolonialism and Science Fiction*. Basingstoke and New York: Palgrave Macmillan.
- Leal L (1995) Magical realism in Spanish American literature. In: Zamora LP and Faris WB (eds) *Magical Realism: Theory, History, Community*. Durham, NC: Duke University Press, 119–124.
- Macaulay TB (1967/1835) Minute on Indian education. In: Young GM (ed.) *Macaulay: Prose and Poetry*. London: Rupert Hart-Davis, 719–730.

- Mukhopadhyay AK (1995) *Colonialism Nationalism and Scientism: A Study of Acharya Jagadis Chandra Bose*. Calcutta: KP Bagchi & Co.
- Nandy A (2003) *Return from Exile: Alternative Sciences, Illegitimacy of Nationalism, the Savage Freud*. Oxford: Oxford University Press.
- Prakash G (1999) *Another Reason: Science and the Imagination of Modern India*. Princeton, NJ: Princeton University Press.
- Raha S and Siddiqi M (2011) Bose Institute: A historical perspective, 1917–47. In: Das Gupta U (ed.) *Science and Modern India: An Institutional History, c. 1784–1947*. Delhi: Pearson, 963–988.
- Rieder J (2008) *Colonialism and the Emergence of Science Fiction*. Connecticut, CT: Wesleyan University Press.
- Smith ED (2012) *Globalization, Utopia and Postcolonial Science Fiction: New Maps of Hope*. Basingstoke and New York: Palgrave Macmillan.
- Varughese ED (2013) *Reading New India: Post-millennial Indian Fiction in English*. London: Bloomsbury.
- Varughese ED (2017) *Genre Fiction of New India: Post-millennial Receptions of “Weird” Narratives*. New York and London: Routledge.